

An outbreak of *Salmonella typhi-murium* food poisoning

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This paper describes an outbreak of food poisoning in the North London area due to *Salmonella typhi-murium* which accounted for at least twenty-one cases and sixteen symptomless infections from 23 June to 17 July 1963.

In the literature there are many accounts of food poisoning due to *S. typhi-murium* involving large numbers of individuals who had eaten the same infected meal and subsequently become ill (Harvey, Price, Davis & Morley-Davies, 1961; Lennox, Harvey & Thomson, 1954). This incident differed in that the outbreak and the subsequent investigations extended over a period of 25 days. Not only were cases reported day by day, but from different parts of a large borough. Seven infections were diagnosed during the first week, twenty-two during the second and a further eight found among family contacts of cases during the third and fourth weeks.

CLINICAL FINDINGS

All patients had fever and diarrhoea, some had headache, nausea and abdominal pain, and others also complained of malaise and weakness in the limbs. Approximately half the patients were severely ill—an infant of 11 months was admitted to hospital with pyrexia and nuchal rigidity, and a 7-year-old boy became delirious.

INVESTIGATION

An intensive investigation was begun as soon as word was received from the local public health laboratory that there appeared to be an increase in the number of isolations of *S. typhi-murium* from cases of gastro-enteritis in the district. The investigation was conducted along the lines set out by Savage (1956). Faecal specimens were taken from the patients, from their families and from other close relatives (Cockburn, 1960).

As the initial phase of the investigation got under way, two common factors emerged. The public health laboratory continued to report the isolation of *S. typhi-murium* phage-type 1a from all cases of gastro-enteritis. It was also found that in all but two of the cases, cakes and (or) bread had been eaten which had originated from a particular bakery firm's bakehouse or from one of its branch shops in the borough. This firm distributed its bread, cake and pastry products to shops, restaurants, cafés, public houses and industrial undertakings in the area.

With suspicion falling on the firm referred to, a preliminary inspection of the parent bakery was carried out. This revealed an abominable lack of hygiene; with filthy sinks, grimy towels, and a total absence of soap. All baking equipment and trays were swabbed for pathogens and a number of very questionable looking bench

washing cloths (rags) removed for laboratory examination. Concurrently, faecal specimens were procured from all available members of the staff both there and from a branch-shop nearby.

INITIAL RESULTS—EXTENSION OF INVESTIGATION

At the bakehouse, an apprentice baker of fifteen (who figures largely in the investigation) and a female packer of cakes and bread, were found to be infected with *S. typhi-murium* phage-type 1a; both were symptom-free. A female assistant from the branch shop, though likewise asymptomatic, was found to be excreting an identical organism in her faeces. A profuse mixed growth of bacteria was obtained from several mixing bowls, a beater, from the surface of a baking bench and from two sinks. The filthy washing cloths (rags) habitually used for 'cleaning' bakery benches and equipment, similarly provided a mixed growth of bacteria, but *S. typhi-murium* was not isolated.

The investigation was immediately extended to the other branch shops and arrangements were made to collect faecal specimens from all members of the firm including the vanmen who effected deliveries. Two part-time counter-hands (a mother and daughter) employed at another branch shop were found to be infected with *S. typhi-murium* phage-type 1a. They admitted having had symptoms of vomiting and diarrhoea a week or so previously.

Of the twenty-two *S. typhi-murium* food poisoning cases diagnosed during the second week of the outbreak, fourteen occurred among pupils and staff at a residential school for cripples. Six of the children had symptoms of acute gastro-enteritis between 2 July and 4 July, seven others were subsequently found to be symptomless excretors as was a young nurse on the staff. Although the school did not receive cakes from the firm, bread eaten by staff and patients came from the bakery.

A number of recommendations were immediately put into force at the bakery whereby the hygiene conditions were improved. These consisted in the destruction of all existing scrubbing brushes and washing materials and their replacement by new equipment. The entire bakery premises were scrubbed out and a thorough cleaning of benches, bakery equipment and trays carried out. 'Cidal' toilet soap was provided in plentiful supply outside the male and female W.C.'s, with paper towels replacing the existing roller towelling. All staff were given copies of *The Guide to the Food Hygiene (General) Regulations*, 1960, and it was recommended that all newcomers to the firm be given copies. The extreme importance of scrubbing the hands in hot soapy water and of then immersing them in 'Roccal' for 60 sec. after use of the W.C. was impressed upon all members of the staff. It was also suggested that before starting each new baking process the employee in the bakehouse should routinely immerse the hands for 60 sec. in 'Roccal'.

All infected food-handlers were excluded from work in the usual way. The submission by cases (and symptomless excretors) of three negative stools taken at intervals of 3 days was taken as indicating post-treatment freedom from infection.

A foreman baker and his family who had been on holiday (29 June–13 July) were investigated on their return. The baker's faecal specimen was negative but his 7-year-old daughter was found to be a symptomless excretor of *S. typhi-murium* phage-type 1a. The father had experienced pruritus ani on or about 29 June.

The apprentice baker previously referred to, and who was a symptomless excretor, had joined the firm on 10 June, 12 days before the onset of symptoms in the first case. One month before joining the staff (whilst employed in a clothing factory) he had been incapacitated for a whole day with a severe febrile headache which had not been accompanied by enteritis. On interrogation by one of us (T.F.M.J.) his description of his duties and personal habits appeared to be of significance in the possible chain of infection.

From the first few days of his new employment, he was given cakes to pack in trays, then he graduated to the filling and decorating of confectionery. On arriving at work, it was his responsibility to prepare cream doughnuts by cutting down the centre of each with a knife, then by hand squirting in artificial cream from a porous bag which he had previously filled from the mixer. He also decorated the fairy cakes by taking cherries from a jar, splitting each cherry in half with his finger nails and placing a half cherry on top of the icing on each cake. He sugared ring doughnuts by immersing them in a bin of sugar, moving them to and fro by hand. He prepared cream slices as follows: jam was transferred from a spoon to his fingers which he then trailed along the surface of a length of pastry. On top of this, artificial cream was squirted followed by a covering of pastry on the surface of which fondant was spread by means of a knife. Coralettes were finally sprinkled over the fondant. His duties were also concerned with the packing of these and other confectionery into trays, either to be sold subsequently in the front shop, or to await collection for distribution to branch shops and elsewhere. His daily routine included the washing down of the baking benches and the 'cleaning' of the mixing bowls and equipment which he effected by using any one of a number of cloths (rags) which hung over the side of a sink close to the W.C. Following a bowel evacuation, it was his practice to 'run his hands' under a tap, and then wash them at the sink using one of the self same rags used previously (and later) for the so-called cleaning of benches and equipment!

DISCUSSION

Twenty-one cases of gastro-enteritis due to *S. typhi-murium* phage type 1a together with a further sixteen symptomless excretors, were revealed during the investigation.

All but two of the thirty-seven persons involved had eaten cakes and (or) bread obtained either directly or indirectly from the bakery firm. Considering the firm's wide distribution of its products (and human forgetfulness) it is possible that the two others had also eaten bread or pastries produced by the bakery firm in question.

The school for cripples did not receive cakes from the firm, but bread eaten by staff and patients came from the bakery. Hence, though it was not established that

the bread eaten had been infected, it is possible that it could have been contaminated with the floury dusts and debris from trays which had been used for infected pastries (Taylor, 1960); alternatively an infected food handler or infected equipment undetected at the stage of investigation might have been responsible.

The evidence pointed to the bakery firm as the likely source of infection, and in particular to its headquarters bakehouse; for it was on the premises of the latter that the pastries, confectionery and bread were baked, and it was from there that the branch-shops and all catering and other establishments were supplied. Preliminary investigation of the bakery revealed no pathogenic organisms in the raw materials used in the preparation of bread and confectionery; nevertheless, some of the equipment, and all the washing cloths, grew heavy mixed growths of organisms on culture, and the factory hygiene was of a very low standard.

If the cream cakes and other confectionery and bread did cause food poisoning, how had they been infected with *S. typhi-murium* if the raw materials from which they had been prepared were free from pathogens? According to Taylor (1960), food found to be the vehicle need not necessarily contain an infected ingredient, but may become infected through infected bakery dust contaminating it by settling on it, or by the use of infected equipment. Also, cream confectionery has a reputation for acting as a suitable medium for the proliferation of salmonellae (Reports, 1958 *a, b*) and the working temperature of the bakehouse would favour multiplication of organisms. The foreman baker who used the mixer experienced pruritus ani on or about 29 June when he left on holiday. It is possible, despite the fact that he was subsequently found to be negative, that he might have had a fleeting infection before going on leave and that he was the source of the trouble. His daughter was found to have a latent infection when the family returned home on 13 July.

On the other hand, the apprentice baker, who was excreting organisms and who was so intimately concerned with the cream cakes and pastries, had only recently joined the firm, having suffered from a particularly severe febrile headache one month before this. He had no symptoms of food poisoning but his faeces were positive for *S. typhi-murium* phage-type 1a. It is generally accepted that an attack of salmonella food poisoning can begin with a headache and chills (Dack, 1956), hence it is tempting to regard his previous febrile headache as having been associated with a salmonella infection. It cannot be said with certainty that this teenage apprentice baker was the source of the outbreak. However, when it is considered that he worked with and handled the cakes and pastries as he did, that he was completely ignorant of food hygiene and had poor personal standards, at the same time as he was excreting *S. typhi-murium* in his faeces, the likelihood of his having at least spread the infection cannot be denied. If in fact he was the source of the infection, it can readily be seen how food prepared on the premises became contaminated. Outbreaks such as that described will continue to arise where dirty working conditions are permitted and where untrained adolescents are allowed to do such work.

SUMMARY

1. An outbreak of food poisoning due to *Salmonella typhi-murium* phage-type 1a is described.

2. Bread and (or) bakery confectionery eaten by all but two of the victims, had originated from a particular bakery firm.

3. *S. typhi-murium* phage-type 1a was found in the stools of an apprentice baker, a female packer of cakes and bread, and in three female counter-hands. The apprentice baker was responsible for the preparation and decoration of the confectionery which was distributed to the branch-shops and other establishments throughout the area.

4. *S. typhi-murium* was not found in any of the raw materials used at the bake-house.

5. The cases which arose at a residential school for cripples gave a ratio of six cases to eight symptomless excretors.

6. Seven weeks after the start of the outbreak the last of the infected food-handlers was considered to be free from infection and fit to return to work.

Twelve weeks later the last member of the public was declared to be negative.

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REFERENCES

- COCKBURN, W. C. (1960). Reporting and incidence of food poisoning. *Roy. Soc. Hlth J.* **80**, 249.
- DACK, G. M. (1956). *Food Poisoning*, 3rd edition, p. 166. Chicago University Press.
- HARVEY, R. W. S., PRICE, T. H., DAVIS, A. R. & MORLEY-DAVIES, R. B. (1961). An outbreak of salmonella food poisoning attributed to bakers' confectionery. *J. Hyg., Camb.*, **59**, 105.
- LENNOX, M., HARVEY, R. W. S. & THOMSON, S. (1954). An outbreak of food poisoning due to *Salmonella typhi-murium*, with observations on the duration of infection. *J. Hyg., Camb.*, **52**, 311.
- REPORT (1958a). The contamination of egg products with salmonellae, with particular reference to *Salm. paratyphi B*. A report of the Public Health Laboratory Service. *Mon. Bull. Minist. Hlth Lab. Serv.* **17**, 36.
- REPORT (1958b). Food poisoning in England & Wales, 1957. A report of the Public Health Laboratory Service. *Mon. Bull. Minist. Hlth Lab. Serv.* **17**, 252.
- SAVAGE, W. (1956). Problems of salmonella food poisoning. *Brit. med. J.* **ii**, 317.
- TAYLOR, J. (1960). Salmonellae and salmonellosis. *Roy. Soc. Hlth J.* **80**, 253.